CENWS-OD-TS-DMMO

MEMORANDUM FOR: RECORD March 6, 2008

SUBJECT: DRAFT DETERMINATION ON THE SUITABILITY OF PROPOSED DREDGED MATERIAL FROM THE EAST BLAIR WATERWAY CUTBACK STUDY PHASE, BLAIR WATERWAY, COMMENCEMENT BAY, TACOMA, WASHINGTON, EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT FOR OPEN-WATER DISPOSAL AT THE COMMENCEMENT BAY OPEN WATER SITE.

1. Introduction. The following summary reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Washington Departments of Ecology and Natural Resources, and the Environmental Protection Agency) on the draft suitability of approximately 1 million cubic yards (cy) of dredged material from the Port of Tacoma East Blair Waterway Study Phase Characterization, in the Blair Waterway in Tacoma, Washington. This DRAFT suitability is for study phase information on potential widening of the eastern shoreline of Blair Waterway. No specific project has yet been proposed. The applicability of the information gathered under this characterization will be reviewed and amended as necessary when a specific project is proposed, and a final SDM will then be issued. Disposal of suitable material is anticipated for the Commencement Bay non-dispersive DMMP disposal site, in combination with approved upland sites, approved in-water contained sites, and/or approved beneficial use sites.

   This determination of suitability for open-water disposal is based on the acceptability of the sampling conducted by Port of Tacoma contractors in March 2007 (Table 1). All relevant test data from these sampling events is contained in reports submitted by GeoEngineers as noted in Table 1. These data were considered sufficient and acceptable for decision-making by the DMMP agencies.

Table 1. Regulatory Tracking Dates

SAP received	December 7, 2006
SAP review meeting	January 17, 2007
SAP approved	February 27, 2007
Sampling dates	March 12-15, 2007
Data report submitted Revised data report submitted QA/QC report submitted Dioxin QA/QC report submitted	June 4, 2007 August 1, 2007 August 22, 2007 February 27, 2008
Recency Determination: LM/M Concern (5-7 years)	March 2012 – 2014
DAIS Tracking number	POTEB-1-A-O-242

Table 2. Project Synopsis

Time of proposed dredging	No project proposed at this time
Proposed disposal sites	Commencement Bay open water non-dispersive site; and or at permitted beneficial use site(s); and/or at approved upland locations
Sediment ranking	low-moderate; moderate; native
Predicted dredge volume	1 million cubic yards
Project last dredged	Study characterization for potential new work

1. Background. The Port of Tacoma's Blair Waterway was created incrementally over much of this century. As the waterway was extended, dredged material was used for fill in areas surrounding the waterway up through the 1970s. The waterway has also been dredged repeatedly in the last few years, beginning with the Sitcum Waterway Remediation Project completed in 1995. That project removed both contaminated and clean material from the waterway in a combined CERCLA cleanup and navigation deepening project. Since that time, Port of Tacoma development projects have led to further deepening of the Blair, expansion of the turning basin, and widening of some portions of the waterway.

   The Port of Tacoma is presently evaluating the feasibility of cutting back the eastern shoreline of the outer portion of the Blair Waterway to upgrade the waterway's marine cargo and shipping capabilities. The study area extends to a maximum of 120 ft. east of the existing shoreline along a length of approximately 4,100 feet

2. Sampling. Sampling took place on approximately 317,000 cy of the total proposed one million cy study area. As in previous cutback projects along the Blair waterway, only the top eight feet of native sediments were sampled, except for one discreet sample at the bottom of the dredge prism. The remaining 683,000 cy in the study area are deep native sediments that the DMMP determined, as part of its Tier 1 evaluation, were not necessary to characterize. Sampling took place from March 12-15, 2007. All samples were taken with an upland drill rig that took 12 borings according to the approved SAP. Samples from all borings taken in a given DMMU were composited for analysis.

3. Chemical Analysis., The Agencies' approved sampling and analysis plan was followed and quality assurance/quality control guidelines specified by PSEP and the DMMP were generally complied with. Chemical analyses were performed by Analytical Resources Incorporated (ARI) of Tukwila, Washington.

   Conventional results are presented in Table 3. Chemical analysis results (Table 4) demonstrated that most chemicals of concern were not detected. Mercury was detected at 0.45 mg/kg in DMMU 2, slightly over the SL of 0.41 mg/kg. PCBs were detected in DMMUs 1 and 3 at levels under the DMMP SLs, but over the SMS guidelines for PCB levels in beneficial use material. The Port chose to forgo further analyses for these three DMMUs and to accept the regulatory determination that would be made based on the chemical analysis only. All three DMMU were surface DMMUs, consisting of the top four feet of fill material placed decades ago as part of the early formation of the Blair waterway.

4. Project-Specific Chemical Analysis (Dioxins and PCB congeners). Because of proximity to an ongoing Superfund cleanup site (Occidental Chemical Company on the Hylebos Waterway), some additional analyses were required to rule out migration of these contaminants to the study area. The DMMP required analyses for dioxins and furans (PCDD/F) and PCB congeners on material composites representing different sediment depths and potential paths of exposure. PCDD/F, as well as dioxin-like PCB congeners that were not detected with typical Aroclor analysis, have been found on the nearby Superfund site and there was no information with which to rule out the potential for contamination migrating from this site to study area sediments. Five analyses for PCDD/Fs and PCB congeners were performed: C1 was a composite of surface fill DMMUs 1, 2 & 3, C2 was a composite of the DMMUs 4 & 5 (subsurface fill), C3 was a composite of DMMUs 6 & 7 (deeper subsurface fill), and C4 was a composite of DMMUs 9, 10 & 11 (top 4 feet of native material). One discrete sample (S4) was taken at a depth consistent with ground water transport.

Dioxins and Furans. PCDD/F data were reported as total equivalency quotients (TEQs) using World Health Organization (WHO 2005) toxic equivalency factors for human health/mammals. TEQs were calculated using a value of one half the reporting limit for non-detected values (Table 5). Data collection, analysis and reporting generally followed guidelines put forth by the DMMP (SMARM 2007).

To evaluate the dioxin data, DMMP used the current interim guidelines in effect since February 2007. These interim guidelines are:

- Based on a comparison of dioxin in test sediments to disposal-site or reference area background.
- For non-dispersive sites, background is defined using disposal-site sediment dioxin data from the vicinity of the disposal site. This data has been collected as part of DMMP site monitoring.
- Disposal-site sediment dioxin concentrations are determined from perimeter, transect, and benchmark locations (e.g. not from any previously-disposed material).
- Dioxin concentrations in any given DMMU may not exceed site maximum.
- Average dioxin concentrations (weighted to the volume of each DMMU) cannot exceed mean disposal site concentration.
- Bioaccumulation testing for dioxin is currently not used to determine suitability for either dispersive or non-dispersive sites.

Monitoring in Commencement Bay found background levels in the area of the disposal site at a mean TEQ of 2.1 ng/kg, and a maximum TEQ of 4.1 ng/kg. The project material tested for this suitability determination had levels of PCDD/F lower than both Commencement Bay site mean and maximum in all DMMUs except C1, which represented the surface DMMUs 1, 2 & 3. Using the current interim guidelines, the DMMP has determined that the sediment represented by DMMU C1 is unsuitable for disposal at any in-water disposal site or for any in-water beneficial use.

DMMU C1 is composed of surface material that was placed as fill material decades ago in earlier dredging of the Blair Waterway. It appears that the low levels of PCDD/Fs found there are residuals left from the previously dredged material that was deposited as fill during construction of the waterway. This assumption is based on the distribution of PCDD/Fs, e.g. they were ubiquitous at low levels in the surface materials in C1 but were not found along potential contaminant pathways from the Occidental Superfund Site such as at groundwater depths.

PCBs. Total PCB's were quantified in test sediments using two different analysis methods; summing homologs and summing Aroclors. Total PCBs based on both methods indicated contamination was highest in the surface composite, and decreased with depth (Table 6). Total PCBs based on the sum of homologs were lower than the totals based on summing Aroclors.

The absence of those PCB homologs which are associated with the presence of dioxin-like congeners as well as the apparent decrease in PCB concentrations with depth, further support our conclusion that contamination does not appear to be moving from the Occidental Superfund site along groundwater or any other pathway to study area sediments.

5. Comparison to SMS Guidelines. All results of the chemical analyses were organic carbon normalized, if necessary, and compared to Washington State Sediment Management Standards. Most of the sediments tested had fairly low total organic carbon (TOC) content (less than 1%). Only samples with TOC greater than 0.5% were carbon normalized (Table 7). Samples with TOC lower than 0.5% had their dry weight concentrations compared with dry weight Apparent Effects thresholds (Table 8). This

evaluation showed that DMMUs 1, 2 & 3 (all surface DMMUs) are unsuitable for in-water beneficial use. All other sediments in this project are suitable for beneficial uses under Washington State Sediment Management Standards and DMMP guidelines. As always, actual beneficial uses must be approved in other applicable permits and/or authorizations.

6. Draft Suitability. This memo documents the suitability of potential dredged sediments within the East Blair Waterway Study Phase Characterization area for open-water disposal. The data gathered were deemed sufficient and acceptable for regulatory decision-making under the DMMP program. Based on these results, the DMMP agencies concluded that all surface material--DMMUs 1, 2 & 3--are unsuitable for in-water disposal at the Commencement Bay non-dispersive disposal site or for in-water beneficial use. All other tested sediments are suitable for in-water disposal and/or beneficial use.

   This draft suitability determination does not constitute agency approval of any project. A final suitability determination will be made when application for a specific project is received. Depending on timing, location and/or changed conditions in the project area, further characterization may be required before final suitability for open water disposal and/or beneficial use is given. Because some of these composites were based on large volumes, it should also be noted that higher resolution testing of the failed DMMU sediments (for example, as part of a specific proposed project) could provide data to better delineate areas of unsuitable material for the final suitability determination.

7. References.

GeoEngineers 2007. Study Phase Characterization, East Blair Waterway, Port of Tacoma, Washington. File No. 0454-094-04

SMARM 2007. Polychlorinated Dioxins and Furans (PCDD/F): Clarification Of Procedures for Acquiring Sediment Data. Prepared by Sandy Lemlich (U.S. Army Corps of Engineers); Erika Hoffman (U.S. Environmental Protection Agency); John Wakeman (U.S. Army Corps of Engineers).

World Health Organization (WHO) 2005. *Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds*. ToxSci Advance Access published online July 7, 2006 at http://www.who.int/ipcs/assessment/tef_update/en/

Table 3. Conventional Results for 2007 GH O&M Characterization.

		SURFACE FILL			*SUBSURFACE FILL*				*SUBSURFACE NATIVE*			
PARAMETER		DMMU 1	DMMU 2	DMMU 3	DMMU 4	DMMU 5	DMMU 6	DMMU 7	DMMU 9[1]	DMMU 10	DMMU 11	S4
Volume (cubic yards)		15,216	10,116	13,496	52,260	43,198	42,279	25,056	40,440	37,584	37,372	n/a
Grain Size	% Gravel	25.2	11.0	20.2	17.1	4.5	0.1	0.2	0.6	1.6	0.6	no data [3]
	% Sand	65.4	78.1	64.2	64.8	77.1	59.7	63.2	55.4	83.6	79.1	
	% Silt	7.5	9.2	13.1	15.8	15.5	33.7	31.1	33.1	11.1	16.6	
	% Clay	1.6	1.6	2.5	2.3	2.6	6.5	5.5	11.2	3.7	3.8	
	% Fines (clay+silt)	9.1	10.8	15.6	18.1	18.1	40.2	36.6	44.3	14.8	20.4	
Total Solids, %		92.3	93.8	92.2	83.0	84.7	79.6	74.9	78.3	78.3	77.8	82.3
Total Volatile Solids, %		not analyzed[2]										
Total Organic Carbon, %		0.525	0.337	0.200	0.141	0.116	0.310	0.390	0.566	0.430	0.421	0.422
Total Sulfides, mg/kg		<1.16 U	<1.11 U	2.83	2.87	72.1	156	103	<1.27 U	6.02	2.07	5.09
Total Ammonia, mg/kg		<0.11	0.11	0.14	0.95	0.25	9.44	1.51	27.7	9.9	2.28	19

Notes:
[1] There is no DMMU 8 due to field conditions (less material in fill layer than expected.)
[2] No TVS results due to contractor oversight.
[3] Not enough material collected to analyze for grain sizes in sample S4

Table 4. Results of chemical analysis compared to DMMP guidelines.

Chemical	SL	BT	ML	DMMU 1		DMMU 2		DMMU 3		DMMU 4		DMMU 5		DMMU 6		DMMU 7		DMMU 9		DMMU 10		DMMU 11		S 4	
METALS (mg/kg)																									
Antimony	150	---	200	6		5.0	U	5	U	6	U	6	U	6	U	6	U	6	U	6	U	6	U	6	U
Arsenic	57	507.1	700	13		5.0	U	5	U	6	U	6	U	6	U	6	U	6	U	6	U	6	U	6	U
Cadmium	5.1	11.3	14	0.4		0.2	U	0.2	U	0.2	U	0.2	U	0.3	U	0.3	U	0.2	U	0.2	U	0.3	U	0.3	U
Chromium	---	267	---	24.3		14.7		15.4		13.3		11.3		14.9		14.2		15.6		13.6		13.1		14.5	
Copper	390	1027	1,300	141		24.8		16.7		16.0		11.0		20.5		14.9		18.7		16.1		14.5		15.6	
Lead	450	975	1,200	124		38		12		8		2	U	3	U	3	U	2	U	2	U	3	U	3	U
Mercury	0.41	1.5	2.3	0.32		0.45		0.04	U	0.04	U	0.04	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Nickel	140	370	370	16		11		12		9		8		11		10		11		10		9		10	
Selenium	---	3	---	0.5	U	0.5	U	0.5	U	0.6	U	0.5	U	0.7	U	0.6	U	0.6	U	0.6	U	0.6	U	0.6	U
Silver	6.1	6.1	8.4	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Zinc	410	2,783	3,800	227		55		42		39		25		27		24		26		27		25		24	
ORGANICS (µg/kg)																									
Acenaphthylene	560	---	1,300	<61	U	<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Acenaphthene	500	---	2,000	<61	U	<6.1	U	<6.1	U	<6.2	U	<6.2	U	<6.2	U	<6.2	U	<6.2	U	<6.1	U	<6.1	U	<6.2	U
Anthracene	960	---	13,000	72		<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Fluorene	540	---	3,600	<61	U	<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Naphthalene	2,100	---	2,400	<61	U	<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Phenanthrene	1,500	---	21,000	310		<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
2-Methylnaphthalene	670	---	1,900	<61	U	<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Total LPAHs	5,200	---	29,000	382		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Benzo(a)anthracene	1,300	---	5,100	130		<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Benzo(a)pyrene	1,600	---	3,600	100		<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Total Benzofluoranthenes[6]	3,200	---	9,900	240		<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Benzo(g,h,i)perylene	670	---	3,200	86		<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Chrysene	1,400	---	21,000	170		<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Dibenzo(a,h)anthracene	230	---	1,900	42		<6.1	U	<6.1	U	<6.2	U	<6.2	U	<6.2	U	<6.2	U	<6.2	U	<6.1	U	<6.1	U	<6.2	U

Chemical	SL	BT	ML	DMMU 1		DMMU 2		DMMU 3		DMMU 4		DMMU 5		DMMU 6		DMMU 7		DMMU 9		DMMU 10		DMMU 11		S 4	
Fluoranthene	1,700	4,600	30,000	340		<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Indeno(1,2,3-c,d)pyrene	600	---	4,400	<61	U	<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Pyrene	2,600	11,980	16,000	370		<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Total HPAHS	12,000	---	69,000	1478		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
CHLORINATED HYDROCARBONS (µg/kg)																									
Hexachlorobenzene	22	168	230	<2.7	Y	<0.98	U	<0.98	U	<0.98	U	<0.98	U	<0.96	U	<0.98	U	<0.99	U	<0.99	U	<0.96	U	<0.97	U
Hexachlorobutadiene	29	---	270	<2.0	U	<0.98	U	<0.98	U	<0.98	U	<0.98	U	<0.96	U	<0.98	U	<0.99	U	<0.99	U	<0.96	U	<0.97	U
1,2-Dichlorobenzene	35	---	110	<6.1	U	<6.1	U	<6.1	U	<6.2	U	<6.2	U	<6.2	U	<6.2	U	<6.2	U	<6.1	U	<6.1	U	<6.2	U
1,3-Dichlorobenzene	170	---	---	<61	U	<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
1,4-Dichlorobenzene	110	---	120	<61	U	<6.1	U	<6.1	U	<6.2	U	<6.2	U	<6.2	U	<6.2	U	<6.2	U	<6.1	U	<6.1	U	<6.2	U
1,2,4-Trichlorobenzene	31	---	64	<6.1	U	<6.1	U	<6.1	U	<6.2	U	<6.2	U	<6.2	U	<6.2	U	<6.2	U	<6.1	U	<6.1	U	<6.2	U
PHTHALATES (µg/kg)																									
Dimethyl phthalate	71	---	1,400	<61	U	<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Diethyl phthalate	200	---	1,200	<61	U	<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Di-n-butyl phthalate	1,400	---	5,100	<61	U	<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Butyl benzyl phthalate	63	---	970	<6.1	U	<6.1	U	<6.1	U	<6.2	U	<6.2	U	<6.2	U	<62	U	<6.2	U	<6.1	U	<6.1	U	<6.2	U
Bis(2-ethylhexyl) phthalate	1,300	---	8,300	<61	U	<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
Di-n-octyl phthalate	6,200	---	6,200	<61	U	<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
PHENOLS (µg/kg)																									
Pentachlorophenol	400	504	690	<30	U	<30	U	<30	U	<31	U	<31	U	<31	U	<31	U	<31	U	<31	U	<31	U	<31	U
Phenol	420	---	1,200	270		<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
2 Methylphenol	63	---	77	9.1		<6.1	U	<6.1	U	<6.2	U	<6.2	U	<6.2	U	<6.2	U	<6.2	U	<6.1	U	<6.1	U	<62	U
4 Methylphenol	670	---	3,600	<61	U	<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<6.2	U
2,4-Dimethylphenol	29	---	210	18		<6.1	U	<6.1	U	<6.2	U	<6.2	U	<6.2	U	<6.2	U	<6.2	U	<6.1	U	<6.1	U	<6.2	U
MISCELLANEOUS EXTRACTABLES (µg/kg)																									
Benzoic acid	650	---	760	<610	U	<610	U	<610	U	<620	U	<620	U	<620	U	<620	U	<620	U	<620	U	<610	U	<620	U
Benzyl alcohol	57	---	870	<30	U	<30	U	<30	U	<31	U	<31	U	<31	U	<31	U	<31	U	<31	U	<31	U	<31	U
Dibenzofuran	540	---	1,700	<61	U	<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U

Chemical	SL	BT	ML	DMMU 1		DMMU 2		DMMU 3		DMMU 4		DMMU 5		DMMU 6		DMMU 7		DMMU 9		DMMU 10		DMMU 11		S 4	
Hexachloroethane	1,400	---	14,000	<61	U	<61	U	<61	U	<62	U	<62	U	<62	U	<62	U	<62	U	<62	U	<61	U	<62	U
N-Nitrosodiohenylamine	28	---	130	<6.1	U	<6.1	U	<6.1	U	<6.2	U	<6.2	U	<6.2	U	<6.2	U	<6.2	U	<6.1	U	<6.1	U	<6.2	U
VOLATILE ORGANICS (µg/kg)																									
Ethylbenzene	10	---	50	<1.3	U	<1.0	U	<1.2	U	<1.0	U	<1.2	U	<1.4	U	<1.2	U	<1.0	U	<1.2	U	<1.0	U	<1.0	U
Tetrachloroethene	57	---	210	<1.3	U	<1.0	U	<1.2	U	<1.0	U	<1.2	U	<1.4	U	<1.2	U	<1.0	U	<1.2	U	<1.0	U	<1.0	U
Trichloroethene	160	---	1,600	<1.3	U	1.3		<1.2	U	<1.0	U	<1.2	U	<1.4	U	<1.2	U	<1.0	U	<1.2	U	<1.0	U	<1.0	U
Total Xylene (sum of o-,m-,p)	40	---	160	<1.3	U	<1.0	U	2.4		<1.0	U	1.3		<1.4	U	<1.2	U	<1.0	U	<1.2	U	<1.0	U	<1.0	U
PESTICIDES (µg/kg)																									
Aldrin	10	---	---	<2.0	U	<0.98	U	<0.98	U	<0.98	U	<0.98	U	<0.96	U	<0.98	U	<0.99	U	<0.99	U	<0.96	U	<0.97	U
Chlordane	10	37	---	<2.0	U	<0.98	U	<0.98	U	<0.98	U	<0.98	U	<0.96	U	<0.98	U	<0.99	U	<0.99	U	<0.96	U	<0.97	U
DDD				<3.9	U	<2.0	U	<2.0	U	<2.0	U	<2.0	U	<1.9	U	<2.0	U	<2.0	U	<2.0	U	<1.9	U	<1.9	U
DDE				<3.9	U	<2.0	U	<2.0	U	<2.0	U	<2.0	U	<1.9	U	<2.0	U	<2.0	U	<2.0	U	<1.9	U	<1.9	U
DDT				<16	Y	<2.0	U	<2.0	U	<2.0	U	<2.0	U	<1.9	U	<2.0	U	<2.0	U	<2.0	U	<1.9	U	<1.9	U
Total DDT	6.9	50	69	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dieldrin	10	---	---	<3.9	U	<2.0	U	<2.0	U	<2.0	U	<2.0	U	<1.9	U	<2.0	U	<2.0	U	<2.0	U	<1.9	U	<1.9	U
Heptachlor	10	---	---	<2.0	U	<0.98	U	<0.98	U	<0.98	U	<0.98	U	<0.96	U	<0.98	U	<0.99	U	<0.99	U	<0.96	U	<0.97	U
Lindane	10	---	---	<2.0	U	<0.98	U	<0.98	U	<0.98	U	<0.98	U	<0.96	U	<0.98	U	<0.99	U	<0.99	U	<0.96	U	<0.97	U
PCBs (µg/kg)																									
Aroclor 1016				<8.8	U	<3.9	U	<3.9	U	<3.9	U	<3.9	U	<3.9	U	<3.9	U	<4.0	U	<3.9	U	<3.9	U	<3.8	
Aroclor 1221				<8.8	U	<3.9	U	<3.9	U	<3.9	U	<3.9	U	<3.9	U	<3.9	U	<4.0	U	<3.9	U	<3.9	U	<3.8	
Aroclor 1232				<8.8	U	<3.9	U	<3.9	U	<3.9	U	<3.9	U	<3.9	U	<3.9	U	<4.0	U	<3.9	U	<3.9	U	<3.8	
Aroclor 1242				<8.8	U	<3.9	U	<3.9	U	<3.9	U	<3.9	U	<3.9	U	<3.9	U	<4.0	U	<3.9	U	<3.9	U	<3.8	
Aroclor 1248				<8.8	U	<3.9	U	21		<3.9	U	<3.9	U	<3.9	U	<3.9	U	<4.0	U	<3.9	U	<3.9	U	<3.8	
Aroclor 1254				34	P	<3.9	U	9.1		<3.9	U	<3.9	U	<3.9	U	<3.9	U	<4.0	U	<3.9	U	<3.9	U	<3.8	
Aroclor 1260				38		<3.9	U	19		<3.9	U	<3.9	U	<3.9	U	<3.9	U	<4.0	U	<3.9	U	<3.9	U	<3.8	
Total PCBs (mg/kg OC)	130	38 [6]	3,100	13.7		<1.16		24.55		<2.77		<3.36		<1.26		<0.69		<0.45		<0.91		<0.93		<0.90	

Notes:
- **Bolded** values indicate exceedance of DMMP SL
- DMMP Criteria are those in place in 2005, when the SAP for this project was approved

Table 5. Results and TEQ comparisons from dioxin/furan analysis.

	TEF	C1	C2	C3	C4	S4	C1	C2	C3	C4	S4	C1	C2	C3	C4	S4
	WHO 2005	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ND=1/2 RL TEQ					ND=0 TEQ				
Dioxins																
2,3,7,8-TCDD	1	<0.36	<0.3	<0.18	<0.13	<0.16	0.18	0.15	0.09	0.07	0.08	0	0	0	0	0
1,2,3,7,8-PeCDD	1	2.0	<0.5	<0.25	<0.27	<0.40	2.00	0.25	0.13	0.14	0.20	2.0	0	0	0	0
1,2,3,4,7,8-HxCDD	0.1	<0.6	<0.33	<0.20	<0.28	<0.20	0.03	0.02	0.010	0.014	0.010	0	0	0	0	0
1,2,3,6,7,8-HxCDD	0.1	5	0.7	<0.23	<0.28	<0.24	0.50	0.07	0.012	0.014	0.012	0.50	0.07	0	0	0
1,2,3,7,8,9-HxCDD	0.1	3.2	0.7	<0.19	<0.25	<0.23	0.32	0.07	0.010	0.013	0.012	0.32	0.07	0	0	0
1,2,3,4,6,7,8-HpCDD	0.01	110	14	<0.21	0.5	0.5	1.10	0.14	0.001	0.005	0.005	1.10	0.14	0	0.01	0.01
OCDD	0.0003	970	130	<0.94	<0.38	<0.46	0.291	0.039	0.0001	0.0001	0.0001	0.29	0.04	0	0	0
Furans																
2,3,7,8-TCDF	0.1	8	0.4	<0.12	<0.11	0.1	0.80	0.04	0.006	0.006	0.01	0.80	0.04	0	0	0.01
1,2,3,7,8-PeCDF	0.03	<0.73	<0.38	<0.19	<0.19	<0.26	0.011	0.006	0.003	0.003	0.004	0	0	0	0	0
2,3,4,7,8-PeCDF	0.3	4.8	0.5	<0.23	<0.18	<0.30	1.44	0.15	0.035	0.027	0.045	1.44	0.15	0	0	0
1,2,3,4,7,8-HxCDF	0.1	2.0	<0.31	<0.18	<0.17	<0.13	0.20	0.016	0.009	0.009	0.007	0.20	0	0	0	0
1,2,3,6,7,8-HxCDF	0.1	<0.4	<0.38	<0.18	<0.17	<0.17	0.020	0.019	0.009	0.009	0.009	0	0	0	0	0
1,2,3,7,8,9-HxCDF	0.1	0.9	<0.36	<0.17	<0.18	<0.16	0.09	0.018	0.009	0.009	0.008	0.09	0	0	0	0
2,3,4,6,7,8-HxCDF	0.1	1.2	<0.30	<0.15	<0.15	<0.13	0.12	0.015	0.008	0.008	0.007	0.12	0	0	0	0
1,2,3,4,6,7,8-HpCDF	0.01	21	3.2	<0.12	<0.13	<0.22	0.21	0.03	0.001	0.001	0.001	0.21	0.03	0	0	0
1,2,3,6,7,8,9-HpCDF	0.01	<0.86	0.4	<0.15	<0.21	<0.25	0.004	0.004	0.001	0.001	0.001	0	0.004	0	0	0
OCDF	0.0003	44	7.9	<0.28	0.3	<0.36	0.013	0.002	0.00004	0.0001	0.0001	0.01	0.002	0	0.002	0
Totals							7.33	1.04	0.33	0.32	0.41	7.08	0.55	0.00	0.01	0.02

Table 6. PCB results of both Aroclor and homolog analysis. Homolog analysis provides an estimate of PCB congeners.

	DMMP			SMS																							
	SL	BT	ML	SQS	CSL	DMMU 1		DMMU 2		DMMU 3		DMMU 4		DMMU 5		DMMU 6		DMMU 7		DMMU 9		DMMU 10		DMMU 11		S 4	
Total Organic Carbon, %						0.53		0.34		0.20		0.14		0.12		0.31		0.39		0.57		0.43		0.42		0.42	
Aroclor PCBs (µg/kg dry wt)																											
Aroclor 1016						8.8	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	4	U	3.9	U	3.9	U	3.8	U
Aroclor 1221						8.8	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	4	U	3.9	U	3.9	U	3.8	U
Aroclor 1232						8.8	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	4	U	3.9	U	3.9	U	3.8	U
Aroclor 1242						8.8	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	4	U	3.9	U	3.9	U	3.8	U
Aroclor 1248						8.8	U	3.9	U	21		3.9	U	3.9	U	3.9	U	3.9	U	4	U	3.9	U	3.9	U	3.8	U
Aroclor 1254						34	P	3.9	U	9.1		3.9	U	3.9	U	3.9	U	3.9	U	4	U	3.9	U	3.9	U	3.8	U
Aroclor 1260						38		3.9	U	19		3.9	U	3.9	U	3.9	U	3.9	U	4	U	3.9	U	3.9	U	3.8	U
Total	130	38[1]	3100			72		3.9	U	49.1		3.9	U	3.9	U	3.9	U	3.9	U	4	U	3.9	U	3.9	U	3.8	U
Aroclor PCBs (mg/kg OC)																											
Aroclor 1016						1.68	U	1.2	U	2.0	U	2.77	U	3.36	U	1	U	1	U	0.71	U	0.91	U	0.93	U	0.90	U
Aroclor 1221						1.68	U	1.2	U	2.0	U	2.77	U	3.36	U	1	U	1	U	0.71	U	0.91	U	0.93	U	0.90	U
Aroclor 1232						1.68	U	1.2	U	2.0	U	2.77	U	3.36	U	1	U	1	U	0.71	U	0.91	U	0.93	U	0.90	U
Aroclor 1242						1.68	U	1.2	U	2.0	U	2.77	U	3.36	U	1	U	1	U	0.71	U	0.91	U	0.93	U	0.90	U
Aroclor 1248						1.68	U	1.2	U	10.5		2.77	U	3.36	U	1	U	1	U	0.71	U	0.91	U	0.93	U	0.90	U
Aroclor 1254						6.48		1.2	U	4.6		2.77	U	3.36	U	1	U	1	U	0.71	U	0.91	U	0.93	U	0.90	U
Aroclor 1260						7.24		1.2	U	9.5		2.77	U	3.36	U	1	U	1	U	0.71	U	0.91	U	0.93	U	0.90	U
Total				12	65	13.71		1.2	U	24.55		2.77	U	3.36	U	1	U	1	U	0.71	U	0.91	U	0.93	U	0.90	U
PCB congeners via homolog analysis[2]						C1 (surface fill)						C2 (subsurface fill)				C3 (subsurface fill)				C4 (subsurface native)						Discrete	
Mean TOC, %						0.35						0.13				0.35				0.47						0.42	
Total PCBs (µg/kg dry wt.)	130		3100			45.1						9.57				1.08				0.749						1.14	
Total PCBs (mg/kg OC)		38		12	65	12.74						7.45				0.31				0.16						0.27	

Notes:

[1] The DMMP BT is for organic normalized data (mg/kg OC)

[2] Total PCBs determined by EPA Method1668A - high resolution gas chromatograph/mass spectrometer (GC/MS) and derived by summing congener homologs.

Table 7. Results of chemical analysis compared to Washington State Sediment Management Standards.

Chemical	SQS	CSL	DMMU 1		DMMU 2		DMMU 3		DMMU 4		DMMU 5		DMMU 6		DMMU 7		DMMU 9		DMMU 10		DMMU 11		S 4	
Total Organic Carbon, %			0.525		0.337		0.200		0.141		0.116		0.310		0.390		0.566		0.430		0.421		0.422	
METALS (mg/kg dry wt.)																								
Antimony	---	---	6		5.0	U	5	U	6	U	6	U	6	U	6	U	6	U	6	U	6	U	6	U
Arsenic	57	93	13		5.0	U	5	U	6	U	6	U	6	U	6	U	6	U	6	U	6	U	6	U
Cadmium	5.1	6.7	0.4		0.2	U	0.2	U	0.2	U	0.2	U	0.3	U	0.3	U	0.2	U	0.2	U	0.3	U	0.3	U
Chromium	260	270	24.3		14.7		15.4		13.3		11.3		14.9		14.2		15.6		13.6		13.1		14.5	
Copper	390	390	141		24.8		16.7		16.0		11.0		20.5		14.9		18.7		16.1		14.5		15.6	
Lead	450	530	124		38		12		8		2	U	3	U	3	U	2	U	2	U	3	U	3	U
Mercury	0.41	0.59	0.32		0.45		0.04	U	0.04	U	0.04	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Nickel	---	---	16		11		12		9		8		11		10		11		10		9		10	
Selenium	---	---	0.5	U	0.5	U	0.5	U	0.6	U	0.5	U	0.7	U	0.6	U	0.6	U	0.6	U	0.6	U	0.6	U
Silver	6.1	6.1	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Zinc	410	960	227		55		42		39		25		27		24		26		27		25		24	
ORGANICS (mg/kg OC)																								
Acenaphthylene	66	66	11.6	U	18.1	U	30.5	U	43.97	U	53.45	U	20	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Acenaphthene	16	57	11.6	U	1.8	U	3.1	U	4.40	U	5.34	U	2	U	1.6	U	1.1	U	1.4	U	1.4	U	1.5	U
Anthracene	220	1,200	13.7		18.1	U	30.5	U	43.97	U	53.45	U	20	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Fluorene	23	79	11.6	U	18.1	U	30.5	U	43.97	U	53.45	U	20	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Naphthalene	99	170	11.6	U	18.1	U	30.5	U	43.97	U	53.45	U	20	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Phenanthrene	100	480	59.0		18.1	U	30.5	U	43.97	U	53.45	U	20	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
2-Methylnaphthalene	38	64	11.6	U	18.1	U	30.5	U	43.97	U	53.45	U	20	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Total LPAHs [2]	370	780	72.8		18.1	U	30.5	U	44.0	U	53.4	U	20.0	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Benzo(a)anthracene	110	270	24.8		18.1	U	30.5	U	44.0	U	53.4	U	20.0	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Benzo(a)pyrene	99	210	19.0		18.1	U	30.5	U	44.0	U	53.4	U	20.0	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Total Benzofluoranthenes6	230	450	45.7		18.1	U	30.5	U	44.0	U	53.4	U	20.0	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Benzo(g,h,i)perylene	31	78	16.4		18.1	U	30.5	U	44.0	U	53.4	U	20.0	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Chrysene	110	460	32.4		18.1	U	30.5	U	44.0	U	53.4	U	20.0	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U

Chemical	SQS	CSL	DMMU 1		DMMU 2		DMMU 3		DMMU 4		DMMU 5		DMMU 6		DMMU 7		DMMU 9		DMMU 10		DMMU 11		S 4	
Dibenzo(a,h)anthracene	12	33	8.0		1.8	U	3.1	U	4.4	U	5.3	U	2.0	U	1.6	U	1.1	U	1.4	U	1.4	U	1.5	U
Fluoranthene	160	1,200	64.8		18.1	U	30.5	U	44.0	U	53.4	U	20.0	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Indeno(1,2,3-c,d)pyrene	34	88	11.6	U	18.1	U	30.5	U	44.0	U	53.4	U	20.0	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Pyrene	1,000	1,400	70.5		18.1	U	30.5	U	44.0	U	53.4	U	20.0	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Total HPAHS	960	5,300	281.5		18.1	U	30.5	U	44.0	U	53.4	U	20.0	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
CHLORINATED HYDROCARBONS (mg/kg OC)																								
Hexachlorobenzene	0.38	2.3	0.5	U	0.3	U	0.5	U	0.7	U	0.8	U	0.3	U	0.3	U	0.2	U	0.2	U	0.2	U	0.2	U
Hexachlorobutadiene	3.9	6.2	0.4	U	0.3	U	0.5	U	0.7	U	0.8	U	0.3	U	0.3	U	0.2	U	0.2	U	0.2	U	0.2	U
1,2-Dichlorobenzene	2.3	2.3	1.2	U	1.8	U	3.1	U	4.4	U	5.3	U	2.0	U	1.6	U	1.1	U	1.4	U	1.4	U	1.5	U
1,3-Dichlorobenzene	--	---	11.6	U	18.1	U	30.5	U	44.0	U	53.4	U	20.0	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
1,4-Dichlorobenzene	3.1	9	1.2	U	1.8	U	3.1	U	4.4	U	5.3	U	2.0	U	1.6	U	1.1	U	1.4	U	1.4	U	1.5	U
1,2,4-Trichlorobenzene	0.81	1.8	1.2	U	1.8	U	3.1	U	4.4	U	5.3	U	2.0	U	1.6	U	1.1	U	1.4	U	1.4	U	1.5	U
PHTHALATES (mg/kg OC)																								
Diethyl phthalate	61	110	11.6	U	18.1	U	30.5	U	44.0	U	53.4	U	20.0	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Dimethyl phthalate	53	53	11.6	U	18.1	U	30.5	U	44.0	U	53.4	U	20.0	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Di-n-butyl phthalate	220	1,700	11.6	U	18.1	U	30.5	U	44.0	U	53.4	U	20.0	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Butyl benzyl phthalate	4.9	64	1.2	U	1.8	U	3.1	U	4.4	U	5.3	U	2.0	U	15.9	U	1.1	U	1.4	U	1.4	U	1.5	U
Bis(2-ethylhexyl) phthalate	47	78	11.6	U	18.1	U	30.5	U	44.0	U	53.4	U	20.0	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
Di-n-octyl phthalate	58	4,500	11.6	U	18.1	U	30.5	U	44.0	U	53.4	U	20.0	U	15.9	U	11.0	U	14.4	U	14.5	U	14.7	U
PHENOLS (µg/kg dry wt.)																								
Pentachlorophenol	360	690	30	U	30	U	30	U	31	U	31	U	31	U	31	U	31	U	31	U	31	U	31	U
Phenol	420	1,200	270		61	U	61	U	62	U	62	U	62	U	62	U	62	U	62	U	61	U	62	U
2 Methylphenol	63	63	9.1		6.1	U	6.1	U	6.2	U	6.2	U	6.2	U	6.2	U	6.2	U	6.1	U	6.1	U	62	U
4 Methylphenol	670	670	61	U	61	U	61	U	62	U	62	U	62	U	62	U	62	U	62	U	61	U	6.2	U
2,4-Dimethylphenol	29	29	18		6.1	U	6.1	U	6.2	U	6.2	U	6.2	U	6.2	U	6.2	U	6.1	U	6.1	U	6.2	U
MISCELLANEOUS EXTRACTABLES																								
Benzoic acid (µg/kg dry wt.)	650	650	610	U	610	U	610	U	620	U	620	U	620	U	620	U	620	U	620	U	610	U	620	U
Benzyl alcohol (µg/kg dry wt)	57	73	30	U	30	U	30	U	31	U	31	U	31	U	31	U	31	U	31	U	31	U	31	U

Chemical	SQS	CSL	DMMU 1		DMMU 2		DMMU 3		DMMU 4		DMMU 5		DMMU 6		DMMU 7		DMMU 9		DMMU 10		DMMU 11		S 4	
Dibenzofuran (mg/kg OC)	15	58	11.62	U	18.1	U	30.5	U	43.97	U	53.45	U	20	U	15.90	U	10.95	U	14.42	U	14.49	U	14.69	U
Hexachloroethane (mg/kg OC)	--	--	11.62	U	18.1	U	30.5	U	43.97	U	53.45	U	20	U	15.90	U	10.95	U	14.42	U	14.49	U	14.69	U
N-Nitrosodiohenylamine (mg/kg OC)	11	11	1.16	U	1.8	U	3.1	U	4.40	U	5.34	U	2	U	1.59	U	1.10	U	1.42	U	1.45	U	1.47	U
VOLATILE ORGANICS (µg/kg dry wt)																								
Ethylbenzene	--	--	1.3	U	1	U	1.2	U	1	U	1.2	U	1.4	U	1.2	U	1	U	1.2	U	1	U	1	U
Tetrachloroethene	--	--	1.3	U	1	U	1.2	U	1	U	1.2	U	1.4	U	1.2	U	1	U	1.2	U	1	U	1	U
Trichloroethene	--	--	1.3	U	1.3		1.2	U	1	U	1.2	U	1.4	U	1.2	U	1	U	1.2	U	1	U	1	U
Total Xylene (sum of o-,m-,p-)	--	--	1.3	U	1	U	2.4		1	U	1.3		1.4	U	1.2	U	1	U	1.2	U	1	U	1	U
PESTICIDES (µg/kg dry wt)																								
Aldrin	--	--	2	U	0.98	U	0.98	U	0.98	U	0.98	U	0.96	U	0.98	U	0.99	U	0.99	U	0.96	U	0.97	U
Chlordane	--	--	2	U	0.98	U	0.98	U	0.98	U	0.98	U	0.96	U	0.98	U	0.99	U	0.99	U	0.96	U	0.97	U
Total DDT	--	--	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0	ND	0
Dieldrin	--	--	3.9	U	2	U	2	U	2	U	2	U	1.9	U	2	U	2	U	2	U	1.9	U	1.9	U
Heptachlor	--	--	2	U	0.98	U	0.98	U	0.98	U	0.98	U	0.96	U	0.98	U	0.99	U	0.99	U	0.96	U	0.97	U
Lindane	--	--	2	U	0.98	U	0.98	U	0.98	U	0.98	U	0.96	U	0.98	U	0.99	U	0.99	U	0.96	U	0.97	U
PCBs (mg/kg OC)																								
Aroclor 1016	--	--	1.68	U	1.2	U	2.0	U	2.77	U	3.36	U	1	U	1.00	U	0.71	U	0.91	U	0.93	U	0.90	U
Aroclor 1221	--	--	1.68	U	1.2	U	2.0	U	2.77	U	3.36	U	1	U	1.00	U	0.71	U	0.91	U	0.93	U	0.90	U
Aroclor 1232	--	--	1.68	U	1.2	U	2.0	U	2.77	U	3.36	U	1	U	1.00	U	0.71	U	0.91	U	0.93	U	0.90	U
Aroclor 1242	--	--	1.68	U	1.2	U	2.0	U	2.77	U	3.36	U	1	U	1.00	U	0.71	U	0.91	U	0.93	U	0.90	U
Aroclor 1248	--	--	1.68	U	1.2	U	10.5		2.77	U	3.36	U	1	U	1.00	U	0.71	U	0.91	U	0.93	U	0.90	U
Aroclor 1254	--	--	6.48		1.2	U	4.6		2.77	U	3.36	U	1	U	1.00	U	0.71	U	0.91	U	0.93	U	0.90	U
Aroclor 1260	--	--	7.24		1.2	U	9.5		2.77	U	3.36	U	1	U	1.00	U	0.71	U	0.91	U	0.93	U	0.90	U
Total PCBs (mg/kg OC)	12	65	13.71		1.2	U	24.55		2.77	U	3.36	U	1	U	1.00	U	0.71	U	0.91	U	0.93	U	0.90	U

Notes:

- Shaded values indicate elevated non-detects due to low TOC. These are compared to dry wt. AET values in next table.
- **Bolded** values are SMS exceedances

Table 8. Comparison of elevated non-detects to PSEP dry wt. AET values for SMS evaluation.

Chemical	Dry wt AET	DMMU 1		DMMU 2		DMMU 3		DMMU 4		DMMU 5		DMMU 6		DMMU 7		DMMU 9		DMMU 10		DMMU 11		S 4	
Total Organic Carbon, %		0.525		0.337		0.200		0.141		0.116		0.310		0.390		0.566		0.430		0.421		0.422	
ORGANICS																							
Fluorene	540					61	U	62	U	62	U												
2-Methylnaphthalene	670							62	U	62	U												
Benzo(g,h,i)perylene	670							62	U	62	U												
Indeno(1,2,3-c,d)pyrene	600							62	U	62	U												
CHLORINATED HYDROCARBONS (mg/kg OC)																							
Hexachlorobenzene	70	2.7	Y			0.98	U	0.98	U	0.98	U												
1,2-Dichlorobenzene	35					6.1	U	6.2	U	6.2	U												
1,4-Dichlorobenzene	110							6.2	U	6.2	U												
1,2,4-Trichlorobenzene	31	6.1	U	6.1	U	6.1	U	6.2	U	6.2	U	6.2	U	6.2	U	6.2	U	6.1	U	6.1	U	6.2	U
PHTHALATES (mg/kg OC)																							
Dimethyl phthalate	71									62	U												
Butyl benzyl phthalate	63									6.2	U			62.0	U								
Bis(2-ethylhexyl) phthalate	1900									62	U												
MISCELLANEOUS EXTRACTABLES																							
Dibenzofuran (mg/kg OC)	540			61	U	61	U	62	U	62	U	62	U	62	U								

Concur:

3/6/08
Date

Lauran Cole Warner, Seattle District Corps of Engineers

3/6/08
Date

Erika Hoffman, Environmental Protection Agency

03/6/08
Date

Laura Inouye, Washington Department of Ecology

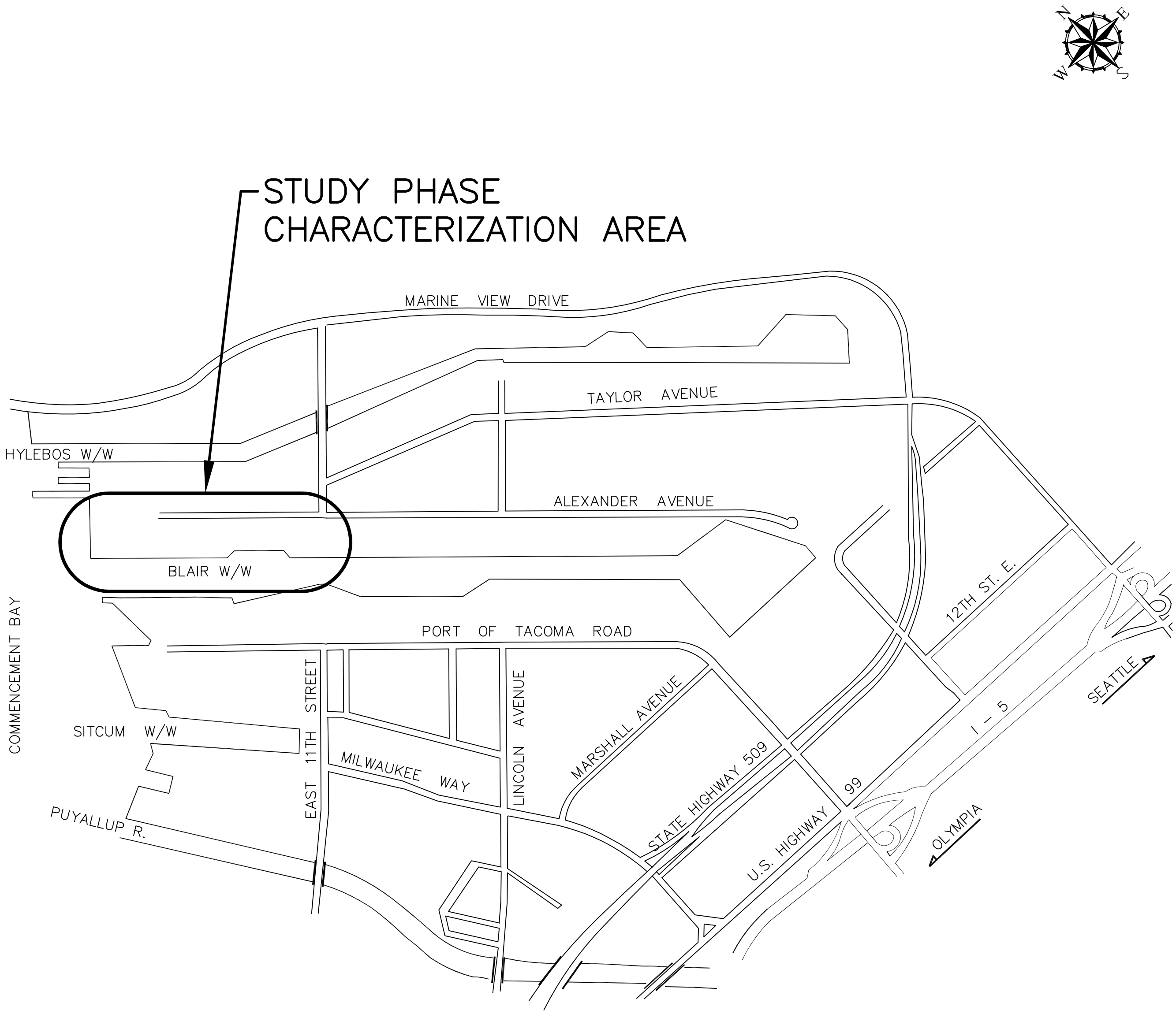
3/6/08
Date

Courtney Wasson, Washington Department of Natural Resources

Attachments: Project figures

Copies furnished:

DMMP Signatories
Jessie Winkler, Corps
Victoria England, GeoEngineers
Sally Fisher, GeoEngineers
Robert Brenner, Port of Tacoma
Glen St. Amant, Muckleshoot Tribe
Bill Sullivan, Puyallup Tribe
DMMO file



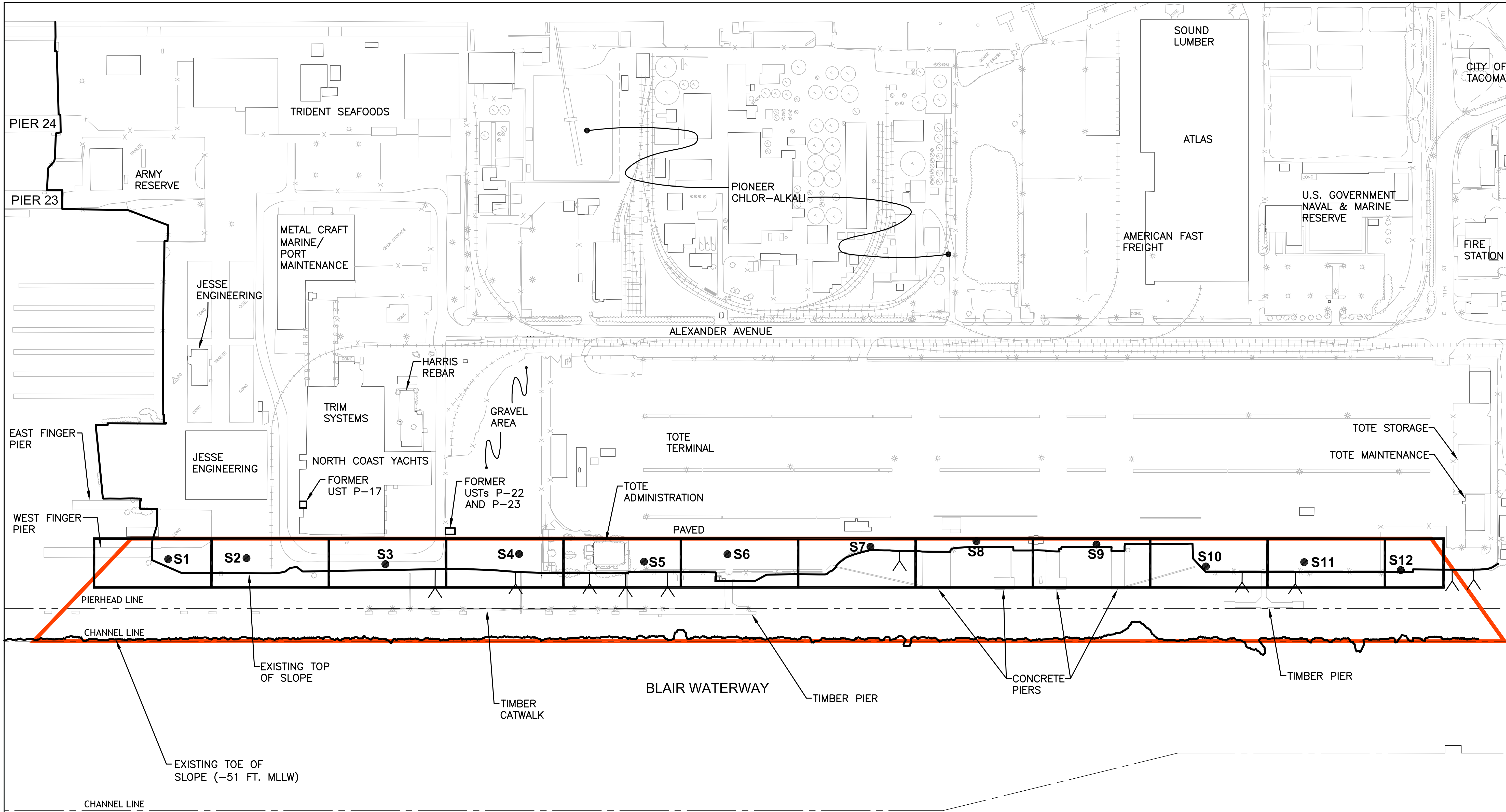
VICINITY MAP NO SCALE

PORT OF TACOMA

Reference: Drawing provided by Port of Tacoma.

Vicinity Map	
Study Phase Characterization	
GeoEngineers	**Figure 1**

TACO\0\0454094\01\CAD\SAP\045409401_SAP_FIG-1.dwg SLF:SCY 09/26/06 rev 09/26/06



Legend

(red line)	Boundary of Characterization Area
S1●	Sampling units and boring number and approximate location
(black line)	DMMU Boundary
⅄	Stormwater outfall locations
▭	Dolphin (27 piles)
☼	Dolphin (6 piles)

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: Basemap provided by Port of Tacoma.

PROJECT NORTH

300 0 300
Feet

PORT of TACOMA U.S.A.

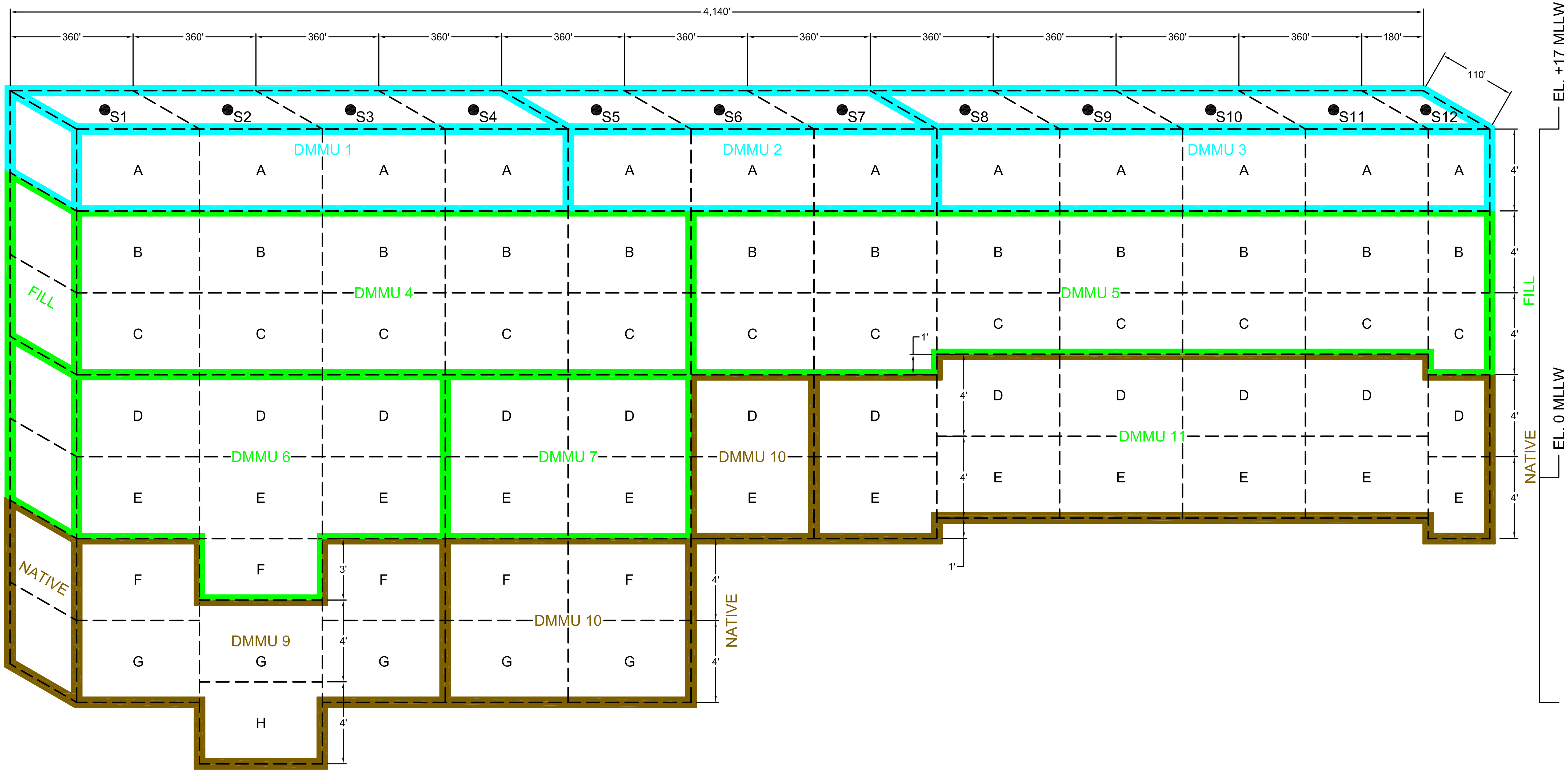
Sampling Units and Boring Locations

Study Phase Characterization

GEOENGINEERS

Figure 4

TACO\0\0454094\04\CAD\045409404_FIG-4.dwg PSD:SLF:LDK 04/05/07 rev 05/14/07



Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. DMMU 8 was not encountered in the field.

Reference: Drawing created from sketch provided by GeoEngineers' personnel.

Legend

Surface fill material (Moderate ranking)

Subsurface fill material (Low-moderate ranking)

Native material (Low-moderate ranking)

DMMU Dredge Material Management Unit

A Subunit identification

Not to Scale

PORT of TACOMA U.S.A.

Schematic DMMU Plan

Study Phase Characterization

GEOENGINEERS

Figure 5

TACO\0\0454094\04\CAD\0454094\04_FIG-5.dwg PSD:SLF:LDK 04/05/07 rev 05/11/07